What is claimed is:

1. A method of detecting the location and luminance transition range of a slant image edge in a digital image comprising pixels, the method comprising the steps of:

(a) defining a two-dimensional window of pixels in the digital image;

(b) determining a variance value for a plurality of pixels around a selected pixel inside said window;

(c) based on the variance value, determining if the selected pixel is in an edge region;

(d) if the selected pixel is in an edge region, then determining if the selected pixel is essentially a center pixel in a luminance transition range of a slant edge; and

(e) if the selected pixel is essentially a center pixel in a luminance transition range of the slant edge, then determining the length of the luminance transition range of the slant image edge.

2. The method of claim 1, wherein:

in step (a) the window comprises a W x H window including $L = W$ x H pixels, wherein the window is centered around the selected pixel; and

in step (b) determining a variance value σ for said plurality of pixels is according to the relation:

$$\sigma = \frac{1}{L} \sum_{i=-1,0,1} \sum_{j=-\frac{W-1}{2}}^{\frac{W-1}{2}} | I_{i,j} - m |$$

wherein i, j are row and column indices for the window,

$I_{i,j}$ represents the luminance value of a window pixel $p_{i,j}$ at row i and column j, such that selected pixel is at row 0, column 0, and

m represents the mean value of said plurality of pixels.

3. The method of claim 2, wherein:

$$m = \frac{1}{L} \sum_{i=-1,0,1} \sum_{j=-\frac{W-1}{2}}^{\frac{W-1}{2}} I_{i,j} \quad .$$

4. The method of claim 1, wherein in step (c) determining if the selected pixel is in an edge region, further comprises the steps of:

comparing said variance value to a threshold T; and

if the variance value is not smaller than T, then the selected pixel is in an edge region.

5. The method of claim 1, wherein in step (d) the

values of the selected pixel and its neighboring pixels are used to determine if the selected pixel is the center pixel in a luminance transition range of a slant edge.

6. The method of claim 5, wherein step (d) further includes the steps of determining the mean value of said plurality of pixels in the window and comparing the luminance value of each pixel to the mean value.

7. The method of claim 6, wherein step (d) further includes the steps of saving the comparison results as binary data for each pixel in the window, wherein if the pixel luminance value is less than the mean value then a binary value x is selected for that pixel, otherwise, another binary value y is selected for that pixel, wherein the binary values form said binary pattern.

8. The method of claim 7, wherein:

a binary data $b_{i,j}$ is defined according to the relation:

$$b_{i,j} = \begin{cases} \text{x} & \text{if } I_{i,j} < m \\ \text{y} & \text{if } I_{i,j} \geq m \end{cases}$$

wherein i, j are row and column indices for

the window,

$I_{i,j}$ represents luminance value of a window pixel $p_{i,j}$ at row i and column j, such that selected pixel is at row 0, column 0, and

m represents the mean value of at least said plurality of pixels; and

the step of determining if the selected pixel is the center pixel in a luminance transition range of a slant edge, comprises the steps of determining if:

$$(b_{-1,0} - b_{1,0}) * (b_{0,-1} - b_{0,1}) \neq 0,$$

$$\sum_{i=-1,1} \sum_{j=-1,1} | b_{i,j} - b_{i,0} | = 0,$$

such that if both conditions are true, then the selected pixel is a center pixel in the luminance transition range of a slant image edge.

9. The method of claim 7, wherein in step (e) determining the length of the luminance transition range of a slant edge further comprises the steps of:

for a column k in the binary pattern, wherein $2 \leq k \leq \frac{W-1}{2}$, initially selecting $k = 2$, and in a loop indexed around k, performing the steps of:

comparing the binary values in column k and column $-k$ of the binary pattern with those in column $k-1$ and column $-(k-1)$ of the binary pattern, respectively,

if the compared values are the same and $k < \frac{W-1}{2}$, then k is increased by 1 and the comparison is repeated,

otherwise if the compared values are the same and $k = \frac{W-1}{2}$, then the loop terminates for the selected pixel, and the luminance transition range is selected as W pixels wide centered around the selected pixel, and

if the compared values are not the same, then the loop terminates for the selected pixel, and the luminance transition range is selected as $2*(k-1)+1$ pixels wide centered around the selected pixel.

10. The method of claim 9, wherein the steps of comparing the binary values in column k and column $-k$ of the binary pattern with those in column $k-1$ and column $-(k-1)$ of the binary pattern, respectively, comprises the steps of determining if the following condition:

$$\sum_{i=-1,0,1}(|b_{i,k}-b_{i,k-1}|+|b_{i,-k}-b_{i,-k+1}|)=0,$$

is true for the selected pixel and its neighboring pixels, such that if the condition is true, then said compared values are the same.

11. A detection system that detects the location and luminance transition range of a slant image edge in a digital image including pixels, comprising:

an edge region detector that determines if a selected pixel in a two-dimensional window of pixels in the digital image, is in an edge region; and

a slant edge center locator configured such that if the selected pixel is in an edge region, the slant edge center locator determines if the selected pixel is essentially a center pixel in a luminance transition range of a slant edge, and if the selected pixel is essentially a center pixel in a luminance transition range of a slant edge, the slant edge center locator determines the length of the luminance transition range of the slant image edge.

12. The detection system of claim 11, wherein the edge region detector further determines a variance value for a plurality of pixels around the selected pixel inside said window, and based on the variance value, determines if the selected pixel is in an edge region.

13. The detection system of claim 12, wherein:

the window comprises a W x H window including L = W x H pixels, wherein the window is centered around the selected pixel; and

the edge region detector determines a variance value σ for said plurality of pixels according to the relation:

$$\sigma = \frac{1}{L} \sum_{i=-1,0,1} \sum_{j=-\frac{W-1}{2}}^{\frac{W-1}{2}} | I_{i,j} - m |$$

wherein i, j are row and column indices for the window,

$I_{i,j}$ represents the luminance value of a window pixel $p_{i,j}$ at row i and column j, such that selected pixel is at row 0, column 0, and

m represents the mean value of said plurality of pixels.

14. The detection system of claim 13, wherein:

$$m = \frac{1}{L} \sum_{i=-1,0,1} \sum_{j=-\frac{W-1}{2}}^{\frac{W-1}{2}} I_{i,j} \quad .$$

15. The detection system of claim 12, wherein the edge region detector further determines if the selected pixel is in an edge region, by comparing said variance value to a threshold T, such that if the variance value is not smaller than T, then the selected pixel is in an edge region.

16. The detection system of claim 11, wherein the slant edge center locator further uses the values of the selected pixel and its neighboring pixels to determine if the selected pixel is the center pixel in a luminance transition range of a slant edge.

17. A detection system that detects the location and luminance transition range of a slant image edge in a digital image including pixels, comprising:

an edge region detector that determines if a selected pixel in a two-dimensional window of pixels in the digital image, is in an edge region; and

a slant edge center locator including a binary pattern data generator, wherein if the selected pixel is in an edge region, then the binary pattern data generator generates a binary pattern for the pixels in the window based on the mean value of said plurality of pixels in the window, the binary pattern comprising binary values

corresponding to the pixel values, such that the slant edge center locator uses the binary pattern to determine if the selected pixel is a center pixel in a luminance transition range of a slant edge, and if so, then determines the length of the luminance transition range around the selected pixel location.

18. The detection system of claim 17, wherein the edge region detector further determines a variance value for a plurality of pixels around the selected pixel inside said window, and based on the variance value, determines if the selected pixel is in an edge region.

19. The detection system of claim 18, wherein:

the window comprises a W x H window including $L = W$ x H pixels, wherein the window is centered around the selected pixel;

the edge region detector determines a variance value σ for said plurality of pixels according to the relation:

$$\sigma = \frac{1}{L} \sum_{i=-1,0,1} \sum_{j=-\frac{W-1}{2}}^{\frac{W-1}{2}} | I_{i,j} - m |$$

wherein i, j are row and column indices for

the window,

$I_{i,j}$ represents value of a window pixel $p_{i,j}$ at row i and column j, such that selected pixel is at row 0, column 0, and

m represents the mean value of at least said plurality of pixels.

20. The detection system of claim 19, wherein:

$$m = \frac{1}{L} \sum_{i=-1,0,1} \sum_{j=-\frac{W-1}{2}}^{\frac{W-1}{2}} I_{i,j} \quad .$$

21. The detection system of claim 18, wherein the edge region detector further determines if the selected pixel is in an edge region, by comparing said variance value to a threshold T, such that if the variance value is not smaller than T, then the selected pixel is in an edge region.

22. The detection system of claim 17, wherein the binary pattern data generator further determines the mean value of said plurality of pixels in the window, and compares the luminance value of each pixel to the mean value, wherein if the pixel luminance value is less than the mean value then a binary value of x is selected for that pixel, otherwise, a binary value of y is selected for that

pixel, wherein the binary values form said binary pattern.

23. The detection system of claim 22, wherein:

the window is a W x H window including $L = W$ x H pixels, wherein the window is centered around the selected pixel;

the binary values, $b_{i,j}$, are defined according to the relation:

$$b_{i,j} = \begin{cases} \text{x} & \text{if } I_{i,j} < m \\ \text{y} & \text{if } I_{i,j} \geq m \end{cases}$$

wherein i, j are row and column indices for the window,

$I_{i,j}$ represents value of a window pixel $p_{i,j}$ at row i and column j, such that selected pixel is at row 0, column 0, and

m represents the mean value of at least said plurality of pixels; and

the slant edge center locator uses the binary values corresponding to the selected pixel and its neighboring pixels to determine if the selected pixel is the center pixel in a luminance transition range of a slant edge.